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TITLE: Network for providing switched broadband multipoint/multimedia intercommunication

Abstract Text (1):
The present invention provides broadband multimedia communication over the standard circuit-switched public switched telephone network infrastructure (PSTN) and other physical or virtual circuit-switched infrastructures while simultaneously and transparently interoperating with the public Internet packet-switched infrastructure to effectively merge the capabilities of the two types of infrastructures into a seamless capability that can bring the benefits of using both types of existing switching infrastructures to large groups of users under the control of the same common and simple interface tools such as web browsers. The invention enables users to establish both packet-switched connections for sending or receiving content for which low-latency and unpredictable response times are not a problem (i.e. text, small graphics, e-mail, small file transfers); and circuit-switched connections for sending or receiving content that benefits from streaming data at fixed data rates, without contention for bandwidth from other users during a communication session, (i.e. video, voice, complex graphics and animations, or large file transfers).

Brief Summary Text (3):
The present invention relates to multimedia communications, and more particularly, to a network that provides variable, on-demand, data bandwidth, for communication sessions between any two or more computers (and/or users) using the network; and even more particularly, a network that provides such variable, on-demand, bandwidth cost effectively not only between computers (and/or users) connected locally (in the same building) using the network, but also between computers (and/or users) across great distances. The present invention effectively combines the usefulness of public packet-switched network infrastructures, such as the Internet, with public circuit-switched network infrastructures such as the public switched telephone network (PSTN), in such a way that a user can benefit from access to and control of both types of switching infrastructures from a single computer using a single, common and standard interface tool such as a web browser.

Brief Summary Text (9):
The present invention aims at providing broadband multimedia communication over the standard circuit-switched public switched telephone network infrastructure (PSTN) while simultaneously and transparently interoperating with the public Internet packet-switched infrastructure to effectively merge the capabilities of the two infrastructures into a seamless capability that can bring the benefits of using both types of existing switching infrastructures to large groups of users under the control of the same common and simple interface tools such as web browsers. The invention enables users to establish both packet-switched connections for sending or receiving content for which low-latency and unpredictable response times are not a problem (i.e. text, small graphics, e-mail, small file transfers); and circuit-switched connections for sending or receiving content that benefits from streaming data at fixed data rates, without contention for bandwidth from other users during a communication session, (i.e. video, voice, complex graphics and animations, or large file transfers).

Brief Summary Text (12):
Yet another object of the present invention is to provide a network that combines access to the public Internet for access to packet-switched services such as a user's LAN and/or the Internet, and to the PSTN infrastructure for access to wide area point-to-point switched-circuit services, using a single physical access connection to an individual user, with seamless World Wide Web browser software control of both classes of service, and the use of Internet Protocol (IP) addressing to control circuit switching over the PSTN circuit switching and transport infrastructure.

Drawing Description Text (17):
FIG. 15 illustrates a power supply and system monitor functional block in a workstation interface such as that illustrated in FIG. 6;

Detailed Description Text (15):
FIG. 4 is a block diagram of an example of the software load on user workstation 100. Initially, the only required software on user workstation 100 is a Java-capable web browser 3102. To provide necessary interaction with the workstation interface 140, however, a daemon process 3104 is instantiated on the user workstation 100. The software on user workstation 100 also includes a user interface process 3106 that is responsible for responding to user inputs from user I/O 105, and for drawing objects on video display 101 via video controller 102. To enable the browser 3102 to handle URLs unique to the broadband network, it is configured with a helper process 3108, whose main function is to notify daemon process 3104 when a broadband network connection is being requested from the browser.

Detailed Description Text (16):
When the workstation 100 is powered on, the daemon process is instantiated and listens for messages from either the browser 3102 (via helper process 3108), requesting to originate a connection, or from the workstation interface 140, indicating that another user is requesting a connection for workstation 100 in which to participate.

Detailed Description Text (18):
When a user is running browser 3102, the browser window 3150 is displayed on the video display 101. If the user desires to originate a broadband network connection, a web site that contains a directory of broadband network users is accessed and the directory viewer 3152 is displayed in the browser window. The directory viewer 3152 contains a list of broadband network users, whose names 3154 are preferably shown as hypertext with links having URLs that are unique to the broadband network. When the user selects a party or parties from the list, the browser 3102 invokes helper process 3108 to handle the request, and helper process 3108 in turn notifies daemon process 3104. Daemon process 3104 invokes user interface process 3106, which draws display window 3160 on video display 101. User interface process 3106 may also draw a dialog box (not shown) asking the user to specify what kind of connection is desired (e.g., audio only, data only, teleconference, etc.). This information is returned to daemon process 3104 and formatted into a connection request that is forwarded to workstation interface 140, which sends the request to network control system server 40 over the signaling network 30.

Detailed Description Text (25):
For additional transparency and reliability in the event of power failure, for example, workstation interface 140 includes cutover relays 171, 172, 173, and 174. During normal operations, these relays are configured to cause signals from and to user workstation 100 to be processed by the workstation interface. However, in the event of power or other failure, the relays are caused to trip, thereby forcing the signals along their normal route, so that such failure does not disturb the otherwise normal functions of the LAN and the workstation.

Detailed Description Text (27):
As shown in FIG. 6, workstation interface 140 includes a video block 200, an audio block 210, a hardware encryption/decryption and security block 220, a CPU core 230, a test and display I/O block 240, a network interface block 250, and a power supply and system monitor block 260. The workstation interface may also include a SVGA display monitor 270.

Detailed Description Text (34):
It is important to note that should the workstation interface 140 fail for any reason whatsoever, (whether due to loss of power, failure of any internal hardware or software component, etc.) the functionality of user workstation 100 and its data connection to the existing LAN router 130 via the premises switch 110 will not be adversely impacted (i.e., the user workstation will still work and can still communicate with the existing LAN router 130). This is possible because in the event of any hardware or software failure in the workstation interface, bypass relays are released causing the user workstation LAN interface 140 to be directly connected to the LAN wire 120 that connects the workstation interface 140 to the premises switch 110.

Detailed Description Text (37):
FIG. 7 illustrates a CPU core 230 in accordance with the embodiment of the invention illustrated in FIG. 6. It includes a clock and power management block 231, a CPU 232, (such as a SPARC, a MIPS, an Am486/K5/K6, etc.), a flash memory 233, a DRAM memory 234, and a PCI bus interface 236, all of which communicate via a local bus 235. PCI bus interface 236 arbitrates communication between the CPU core and other functional components in workstation interface 140 via PCI bus 290. It should be appreciated that although a PCI bus is preferably used in this embodiment, other bus architectures are equally possible. The construction and operation of the above components are well known.

Detailed Description Text (38):
CPU core 230 receives CPU interrupt from power supply and system monitor block 260 via PCI bus 290. In the event of power failure or other workstation interface failure, the CPU interrupt causes shutdown processing to be activated by CPU 232.

Detailed Description Text (44):
In parallel with monitor overlay and output block 300 is cutover relay 171, that forces the video signals to be passed directly to the workstation video display in the event of power failure, for example, as indicated by the failure signal from power supply and system monitor block 260.

Detailed Description Text (58):
Audio digitizer 400 receives audio signals from microphone 152, from the user workstation 100 audio module 106, and from audio device 160, digitizes the audio signals and outputs them either to audio DAC 450 via audio bus 460 and/or to the network via audio mixer 430, and audio bus 460 as is appropriate for the particular audio signal in question. Moreover, audio signals from a user workstation 100 may be passed through directly to speakers 150 via cutover relay 172 in the event of the failure of the workstation interface or its loss of power, as indicated by the failure signal received from power supply and system monitor block 260.

Detailed Description Text (59):
POTS support module 410 receives telephone signals from telephone set 158 and directly outputs such telephone signals to the POTS telephone line interface 159 when cutover relay 174 is released as the result of a power failure or other failure of workstation interface 140, as indicated by the failure signal from power supply and system monitor block 260. This allows the telephone set to always be connected to "life-line" services over an ordinary telephone line in the event of a power failure or other failure of the workstation interface itself. In normal use, the cut-over relay 174 is activated, thereby connecting both the telephone line interface(s) 159 and the telephone set(s) 158 to the POTS support module 410.

Detailed Description Text (77):
Again, it is important to note that any failure of any component in network block 250 will not result in loss of connectivity between the user workstation 100 and the existing LAN router resources 130. For this purpose, cutover relay 173 is provided, which is configured in accordance with the failure signal from power supply and system monitor block 260.

Detailed Description Text (82):
I.B.7. Power Supple and System Monitor Block

Detailed Description Text (83):
FIG. 15 illustrates a power supply and system monitor block 260 in accordance with the embodiment of the invention illustrated in FIG. 6. It includes an external power interface 810, a DC-DC converter 820, a battery 830, and a system monitor module 840.

Detailed Description Text (84):
External power interface 810 receives AC power from an external source (not shown), typically a 120 volt AC wall outlet, and transforms it to a 24 volt DC supply. DC-DC converter 820 receives the 24 volt DC supply output by external power interface 810 and produces regulated DC voltages such as a 5 volt DC supply and a 3.3 volt DC supply needed for operations of the various components of workstation interface 140. DC-DC converter 820 also supplies charging current to rechargeable battery 830, and receives a 12 volt DC voltage from battery 830 when AC power is not supplied by the external source. The purpose of this arrangement is so that the workstation interface 140 does not require an on/off switch. That is, by so equipping the workstation interface, it can be "rung" (like a phone) whenever needed, and network maintenance and test procedures can be invoked across the broadband network regardless of whether a user is actually using the device.

Detailed Description Text (85):
System monitor 840 monitors the status of the external power supply and battery 830, as well as other conditions such as temperature, and generates a CPU interrupt to CPU core 230 when a failure occurs. In addition to generating a CPU interrupt, system monitor 840, upon power failure or other failure of workstation interface 140, generates a failure signal so that cutover relays can be activated in other workstation interface components, thereby assuring that such failure does not adversely affect the normal operations of workstation 100.

Detailed Description Text (108):
Finally, the system object 3010 can perform some housekeeping tasks such as, for example, maintaining a watchdog function that pings the user workstation 100 via port 3026 to know whether the user workstation is on or off. For some connections, the preferred media device may reside on the user workstation 100, but there may be a media device residing on the workstation interface 140 that can fulfill the role required to establish the connection if the user workstation is off. For example, a phone call could ring the handset 158 rather than the user workstation's telephony device.

Detailed Description Text (186):
CPU 116 controls the operations of routing function 113, bonder 114, network interface card 115 and RAM 117. It coordinates the conversion of circuit-switched traffic data on broadband network connections, possibly spread between many bearer channels, into LAN type packet-switched data packets, and vice-versa. It should be noted that CPU 116 and bus 118 can be implemented in many ways. A preferred implementation of CPU 116, for ease of maintenance and low cost, is a CPU capable of running a Unix-like operating system. A multi-processor version can be used to insure adequate computer power for larger installations. A number of major semiconductor companies make such devices, and x86 family devices are currently the most cost-effective. For reason of low cost, the preferred implementation of bus 118 is a Peripheral Component Interconnect (PCI) bus.

Detailed Description Text (209):
FIG. 26 further illustrates a PCI bus controller 1018 in a bus interface controller 1010 such as that illustrated in FIG. 23. In this example, PCI bus controller 1018 is primarily implemented by a PCI 9050 manufactured by PLX Technology, Inc. of San Jose, Calif. As can be seen, it further includes logic circuitry 1018-A, that is responsive to PCI bus control signals 1011 that select a control register read/write operation, to provide control data corresponding to the control registers on local data bus 1017. Refer to PCI specification version 2.1 for a complete description of this bus. As is known, the PCI controller is programmed at startup by PCI boot controller 1012. This tells the PCI controller which bus addresses the CPU will use when it wishes to access devices on the PCI bus. The PCI controller will, when it detects such addresses, generate control signals to select (or activate) the chosen

device, and to indicate whether a read or a write is to be performed.

Detailed Description Text (432):
In this example, assume user A in city A wishes to conduct a live videoconference with user B in city B. If user A's workstation 100-A is not already powered up, user A powers up the workstation and activates a Java-capable browser. From the browser, user A accesses a website containing a directory of broadband network users, and locates user B. User A requests a videoconference by selecting user B's name from the directory, and a helper application for the browser alerts the daemon process loaded onto workstation 100-A, which relays a request to workstation interface 140-A.